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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR          | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-------------------------------|---------------------|------------------|
| 09/543,284      | 04/05/2000  | Boris Dmitrievich Lubachevsky | Lubachevsky-10-2    | 6481             |

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06/06/2005

EXAMINER

STEVENS, THOMAS H

ART UNIT PAPER NUMBER

2123

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/543,284

Applicant(s)

LUBACHEVSKY ET AL.

Examiner

Thomas H. Stevens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 April 2005.  
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-24 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

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### **DETAILED ACTION**

1. Claims 1-20 were previously examined.
2. Claims 21-24 were added.
3. Claims 1-24 were re-examined.

### ***Section I: Response to Applicant's Arguments***

#### ***Remarks***

4. Examiner acknowledges applicant's amendment to claims 2, 3 and 14.

### ***Section II: Non-Final Rejection (3<sup>rd</sup> Office Action)***

#### ***Claim Rejections - 35 USC § 101***

#### ***Non-Statutory Material***

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

MPEP 2106, section 4.

Claims to processes that do nothing more than solve mathematical problems or manipulate abstract ideas or concepts are more complex to analyze and are addressed below. If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Schrader, 22 F.3d at 294-95, 30 USPQ2d at 1458-59. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

The claimed invention is directed to non-statutory subject matter by way of a computer-based mathematical solver since there no mention of a platform or application in mind; the claims in the description reflect "a shell" of the function without a "core" of a specific platform (e.g., " a simulation phase of a manufacturing processing plant for assessment"). Furthermore, although amended claim 1 states outputting results of said simulations from each said N PEs, the specification denotes (pg. 3, line 7), "The process repeats for as long as desired", the invention as an algorithm since the source of the post-solution activity is from an outside agency, i.e., the user/observer and not by the invention itself.

***Claim Rejections - 35 USC § 102***

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Lubachevsky et al ("Synchronous Relaxation for Parallel Simulations with Applications to Circuit-Switched Networks" Paper: 1993). Lubachevsky et al. teaches a general model of synchronous relaxation for parallel simulations with applications to circuit-switched networks (abstract).

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**Claim 1:** A method executed in hardware simulating events comprising the steps of: employing hardware that comprises N processing elements (PEs) that can communicate with each other; subdividing said physical system into N subsystems and assigning a different subsystem (pg. 293, section 3, lines 9-14) of said subsystems to each of said N PEs; in a simulation step, each of said PEs concurrently simulating a respective block of events that occur in each respectively assigned subsystem where said block includes (pg. 312, lines 1-7; and 289, lines 20-25); M edge events, (pg. 305, section 6, "Event-Coupling Model", 2<sup>nd</sup> paragraph) where M is approximately a  $\log_e N$ , e is approximately 2.71828 and an edge event is an event whose simulation in a processing element is directly affected by information originating in another processing element (pg. 289, lines 1-8) repeating step a chosen number of times; and outputting results of said simulations from each of said N PEs.

**Claim 2:** The method of claim 1 where each of said simulation steps comprises one or more iterations (pg 294, figures 2 and 3; pg. 295, lines 15-17).

**Claim 3:** The method of claim 2 where each iteration comprises a simulation phase followed by a communication phase (pg. 299, Gauss-Sidel section) and an assessment phase (pg. 299, computational experience, lines 4-7).

**Claim 4:** The method of claim 3 where, in each communication phase (pg. 299, Gauss-Sidel section), each of said PEs shares information with one or more other PEs from

said N PEs, which information is needed by said other PEs to simulate edge events of said other PEs.

**Claim 5:** The method of claim 4 where said information shared by each PE in a communication phase of an iteration is related to events simulated by said each PE in said iteration (pg. 294, figures 2-3).

**Claim 6:** The method of claim 4 where said assessment phase carried out by each of said PEs comprises the steps of determining whether the existence of a simulation error can be excluded (pg. 302, data flow analysis section, lines 7-13) and directing that another simulation iteration is to take place when the existence of a simulation error cannot be excluded.

**Claim 7:** The method of claim 6 further comprising a floor advancement step, that is carried out when said step of determining, in said assessment phase concludes that there are no simulation errors (pg. 289, section 1.1 Related Work, lines 1-8) iteration, where the advancement step advances a simulation floor time of a present simulation step to form a modified simulation time floor, for simulating another block of M events in a next simulation step (pg. 299, lines 9-15).

**Claim 8:** The method of claim 6 further comprising a step of advancing a simulation floor time from a simulation floor time of a present simulation step, to form a modified

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simulation floor time (pg. 299, lines 9-15), for starting from said modified simulation floor time the simulation of another block of M events in a next simulation step, when said step of determining in said assessment phase concludes that there are no simulation errors (pg. 289, section 1.1 Related Work, lines 1-8) in said present simulation step.

**Claim 9:** The method of claim 8 where said modified simulation floor time corresponds (pg. 299, lines 9-15), to the earliest simulation time of the  $M^{\text{th}}$  edge event simulated by said N PEs in said present simulation step (pg. 289, lines 8-12).

**Claim 10:** The method of claim 4 where events are simulated serially in each simulation phase (pg. 289, lines 13-25).

**Claim 11:** The method of claim 10 where for simulating a second event following a simulation of a first event, a time interval (pg. 293, lines 7-8) is identified between a simulation time of said first event and a simulation time of said second event, and said second event is identified for simulation.

**Claim 12:** The method of claim 11 where said second event is identified for simulation following a step of accounting for simulation of said first event and simulation of events in said other PEs from said N PEs (pg. 295, second paragraph).

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**Claim 13:** The method of claim 12 where said accounting is based on present knowledge of states of said other events (title, introduction).

**Claim14:** The method of claim 12 where said accounts for simulation of events in said other PEs from said N PEs accounts for events simulated during said time interval (figures 2 and 3).

**Claim15:** The method of claim 11 where said second event is identified by employing a first random number (pg.288, last two sentences).

**Claim16:** The method of claim 11 where said time interval is identified with a second random number (pg.288, last two sentences).

**Claim 17:** The method of claim 16 where said second random number is set to said first random number (pg.288, last two sentences).

**Claim 18:** The method of claim 15 where said first random number is derived from a random variable having a uniform distribution (pg. 309, lines 1-6).

**Claim 19:** The method of claim 15 where the seriatim simulation of each event in said block of M events, in a first iteration starting from a given simulation floor time, employs an independently derived random number from said random variable, forming thereby a sequence of random numbers (pg. 305-306, sections 6.0-6.1), and simulation of said

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block of M events in all subsequent iterations starting from said given simulation floor (pg. 299, lines 9-15) time employs said sequence of random numbers.

**Claim 20:** The method of claim 18 where the sequence of random numbers employed in one simulation step is different from a sequence of random numbers employed in another simulation step (pg. 305-306, sections 6.0-6.1).

**Claim 21.** Apparatus the includes N interacting proceeding elements (PEs), (pg. 305, section 6, "Event-Coupling Model", 2<sup>nd</sup> paragraph) the improvement characterized by: each of said N PEs storing a specification of a subsystem of a system composed of interacting subsystem; and said N PEs executing a selected number of simulation steps, and in each simulation step each of said PE's simulates a block of operation events of its associated subsystem, where a block contains M edge events, where M is approximately equal to  $\log N$ , (pg. 289, lines 1-8) and an edge event is an event whose simulation in a processing element, and outputting results of the simulations.

**Claim 22.** A storage element comprising: a first module when executed in a processor, simulates operational events of a stored subsystem that is part of a system of interacting subsystems, primarily in blocks that contain M edge events, (pg. 305, section 6, "Event-Coupling Model", 2<sup>nd</sup> paragraph) in addition to non-edge events, where M is approximately equal to  $\log N$ , (design choice: manipulation of equation 0 and an edge event is an event whose simulation by another module that is substantially the same as

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said first module, which other module is executed in another processor; and a second that outputs simulated operational events resulting from execution of said first module.

**Claim 23.** The storage element of claim 22 (pg. 305, section 6, "Event-Coupling Model", 2<sup>nd</sup> paragraph) further comprising a third module the communicates with said other module.

**Claim 24.** The storage element of claim 23 (pg. 305, section 6, "Event-Coupling Model", 2<sup>nd</sup> paragraph) further comprising a fourth module that assess whether, based on information received by said third module, any of said M edge events need to be re-simulated (design choice: user dependent).

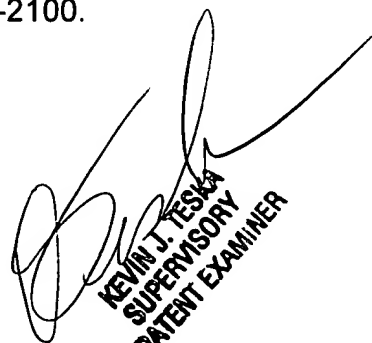
***Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-3715, Monday-Friday (8:00 am- 4:30 pm) or contact Supervisor Mr. Kevin Teska at (571) 272-3716. Fax number is 571-273-3715.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

May 19, 2005

THS

  
KEVIN J. TESKA  
SUPERVISORY  
PATENT EXAMINER